

SKY MYSTERY

by

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I saw something extraordinary on Wednesday, 25 September 2013, at about 10:10 AM local time, while in a parking lot at the NASA Goddard Space Flight Center in Greenbelt, Maryland USA (located in the suburbs of Washington, D.C., about 20 km northeast of the White House). I looked northeast at about a 45 degree angle at a cirrus cloud. The cloud was elongated horizontally from my perspective.

To my surprise I saw a band of ripples rapidly pass from right to left along the axis of the cloud. The ripples appeared dark, like a bar code, with the “bars” being almost vertical (see Figure 1).

There appeared to be approximately 10 bars in the band. Each bar was a few degrees in length. I estimate that each bar was about $1/10$ to $1/4$ degree in width and the white spaces between them about the same width. I guessed that the angular speed of the band passing along the cloud was about $1/2$ to 1 degree per second. A half-moon was in another part of the sky; looking at the Moon later helped me make the estimates.

After a few seconds at most the band disappeared. Then a second band repeated the performance. I kept watching to see if this was going to be a periodic phenomenon, but no further bands appeared; just the two. Of course there may have been other bands passing across the cloud before I started looking. About 30 seconds to a minute after the bands disappeared, a low-flying jetliner on the usual northeast to southwest route passed almost exactly through the spot where I had seen the bands. I estimate the jetliner was a bit bigger than the full moon.

My first thought was that maybe there was something wrong inside my eyes. But looking at other clouds revealed no bands.

So what caused the bands? They do not seem to have been due to the exhausts on top of the nearby building, with the cloud acting as a backdrop: one would expect a continuous, disorganized shimmering instead of two separate organized bands. Moreover, there would be no reason for bands to stop unless the exhausts suddenly stopped right while I was looking at the cloud. Hence the explanation does not seem to be local.

This or a similar phenomenon was photographed in France during World War II, apparently produced by distant artillery. Jones (1947) proffered the explanation that shock waves from the guns were made visible in the sky by a process akin to Schlieren photography, with the cloud apparently acting as a screen against which to view the waves. The photograph shows 3 bars, compared to the 10 or so I saw.

Rather than the cloud just being a backdrop, Andrew T. Young of San Diego State University and my colleague Coerte Voorhies (private communications) point out that the bands may have been made in the cloud itself. A passing disturbance jostling the ice crystals in the cloud would change the reflection of sunlight to the observer, giving the light and dark pattern.

Assuming Young and Voorhies are correct, what made the disturbance? Cirrus clouds range from ~4 km to ~13 km in height. A cloud at a 45 degree angle would be ~5.7 km to ~18.4 km away. For my estimated angular speeds of 1/2 to 1 degree per second and the range of cirrus heights, the linear speeds range from ~100 m s⁻¹ to ~642 m s⁻¹, which is subsonic to supersonic.

Supersonic speed is unlikely. Young suggests that if the disturbance was subsonic, then it may have been due to the twin vortices produced, not by the jet I saw a

half-minute to a minute later, but by a previous jet on the populous route. Twin vortices would explain two bands.

On the other hand, if the bands were sound waves traveling at the speed of sound, $\sim 343 \text{ m s}^{-1}$, Voorhies notes that the range of estimated distances to the cloud and the estimated center-to-center spacing of $1/5$ to $1/2$ degrees between the bars give frequencies between $\sim 5 \text{ Hz}$ and $\sim 17 \text{ Hz}$. This is in the infrasound range.

Possibly a jet or other man-made disturbance produced infrasound. Another possibility is the passage of a large meteorite. The American Meteor Society reported that September 2013 was a busy month for bright meteors (<http://earthsky.org/earth/u-s-midwest-sees-another-bright-fireball>). However, no daylight meteor was noticed near the appropriate place and time, and such a large meteor going undetected except for a lucky sighting of its infrasound signature in a cirrus cloud seems unlikely.

I thank Andrew T. Young and Coerte Voorhies for their input.

Reference

Jones AT. 1947. Secondary shock waves and an unusual photograph. *Amer. J. Phys.*, **15**: 57-59.

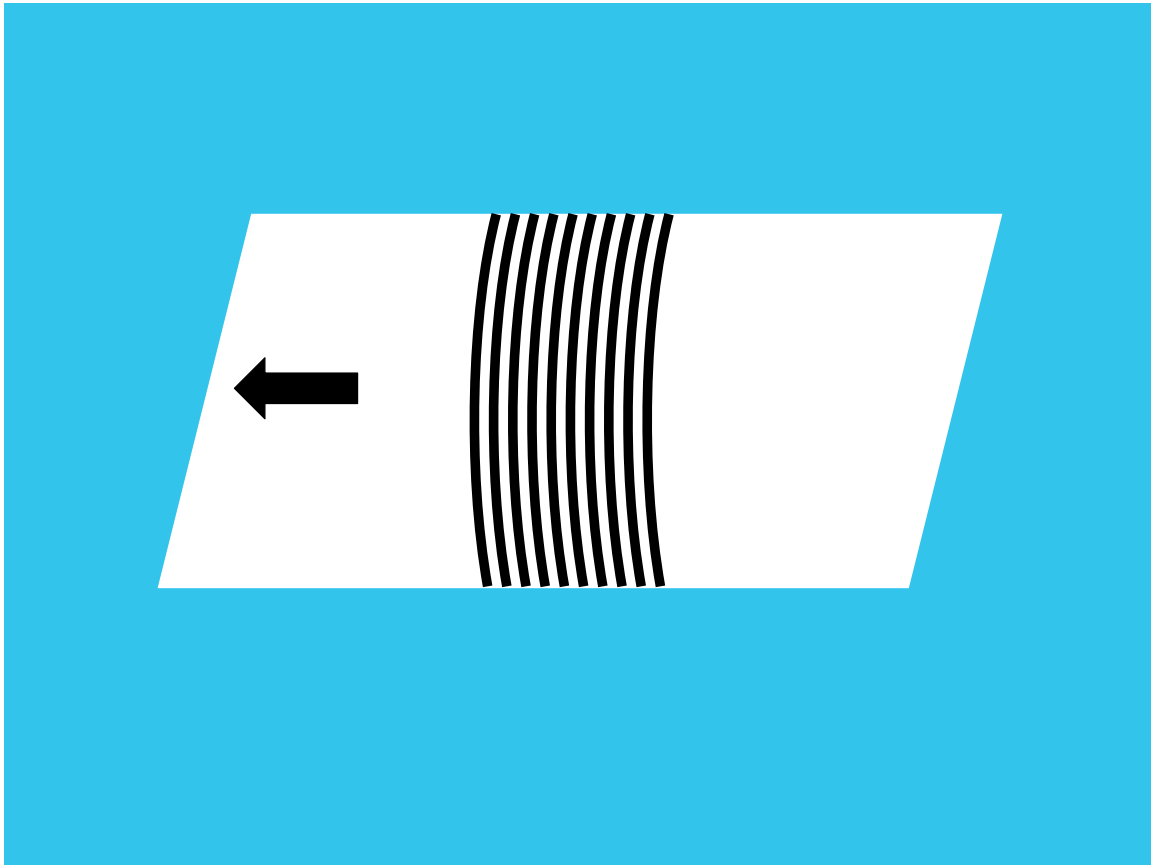


Figure 1

Schematic of one band consisting of dark “bars” seen on 25 September 2013, in or against a cirrus cloud northeast of Greenbelt, Maryland, USA. Two bands were seen, separated by a few seconds. There were approximately 10 bars in each band. Each band traveled at an estimated angular speed of $1/2$ to 1 degree per second. Each bar was an estimated $1/10$ to $1/4$ degree in width, with the white spaces in between being about the same width as the bars.